

REMARKS

Applicants amend claims 46, 48, 50, 51, 52, 57, 69, 77, 78, 81, 84, 88, 92, 93, 94, 95, 96, 97 and 99. Applicants cancel claims 53, 58, 75, 83, 90 and 91. Applicants add new claims 100 and 101. Claims 46-48, 50-52, 55-57, 69-74, 76-82, 84-89 and 92-101 are pending in the applications of which claims 46, 50, 52, 57, 69, 77, 78, 81, 88, 92, 93, 96, 97, 99, and 100 are independent. No claims are withdrawn. The foregoing amendments and new claims introduce no new matter. For the reasons that follow, Applicants respectfully submit that the claims define over the art of record and should be passed into allowance.

Claims 46, 48, 50, 51, 52, 57, 69, 77, 78, 81, 84, 88, 92, 93, 95, 96, 97 and 99 were amended to clarify that the atlas is a prior probability MRI based atlas. Support for this amendment appears in the abstract and throughout the specification. Claim 94 was amended to correct a spelling mistake. Claim 84 was amended to depend from claim 81, instead of claim 83 which is canceled. Independent claims 52, 58, 69, 81 and 88 were amended to incorporate dependent claims. No new matter has been added.

Claim rejections under 35 U.S.C. §103

Claims 46-48, 50-52, 54-58 and 69-99 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent Application 2002/0103428 of deCharms (hereafter deCharms) in view of U.S. Patent Application 2003/0093004 of Sosa et al. (hereafter Sosa). Applicants have amended claims 46, 48, 50, 51, 52, 57, 69, 77, 78, 81, 84, 88, 92, 93, 94, 95, 96, 97 and 99, and in addition, provide the following remarks in support of patentability of the pending claims.

The pending application is generally directed to an atlas containing values representative of magnetic properties of a magnetic resonance (MR) scan and prior probability data relating to tissue type. A tissue type prior probability may be stored in a node of the atlas. A tissue type can include general categories of tissue type such as gray matter, white matter and cerebral spinal fluid. The tissue type can also include an appropriate anatomical structure label such as the hippocampus.

The deCharms reference is generally directed to computer executable software and a device for guiding brain activity training. The invention takes data corresponding to brain activity measurements in internal voxels of a brain, and determines information relevant to brain activity training.

The Sosa reference is generally directed to a three-dimensional map of the probability of brain or heart functional states based on electric and/or magnetic signals measured on the surface of the body. The map is the inverse solution of the EEG/MEG/EKG/MKG problem.

Claims 46-48

deCharms and Sosa, alone or in combination, fail to teach or suggest each and every element of amended independent claim 46. Specifically, deCharms and Sosa fail to teach or suggest, “a prior probability MRI based atlas having magnetic resonance data including tissue type prior probability derived from at least one other subject,” as recited by amended independent claim 46.

In the response to the previous Office Action filed on May 1, 2006, Applicants requested that the Examiner provide a closer relation between the Examiner’s assertions and the cited prior art. The outstanding Office Action does not clarify the relation between the Examiner’s assertions and the deCharms reference, therefore, the arguments made with respect to the deCharms reference in response to the previous Office Action still apply.

The Examiner cited paragraphs [0160], [0164], [0167], [0178] and [0326-0330] to support the contention that deCharms discloses “obtaining information regarding a subject by using... an atlas comprising values representative of the magnetic property of a spatial location of a subject.” Applicants agree that deCharms relates data to anatomical brain regions, as this is clearly known in the prior art, however, the invention of claim 46 includes a specific atlas having *magnetic resonance data including tissue type prior probability derived from at least one other subject*. The Office Action states that “deCharms teaches said atlas to include a plurality of nodes with each node including statistical information such as mean and variance derived from a number of subjects ...,” and cites paragraphs ([0180] [0256] [0264] [0270] [0326] [0328] [0329] [0439] [0465] [0471] [0485] [0525] [0625]). None of these cited paragraphs, nor the rest of

deCharms, teach or suggest *an MRI based atlas* with a plurality of nodes including information *derived from at least one other subject*.

The Office Action further states that, “deCharms teaches providing magnetic property values corresponding to tissue types and subject, labeling tissue types corresponding the [sic] magnetic resonance property values pertaining to the subject by the use of the atlas having said MR values derived from other subjects...,” and cites paragraphs [0260] and [0449] to support this assertion. Neither the cited paragraphs, nor any of the rest of deCharms, teaches or suggests an MRI based atlas with information from multiple subjects. Further, the phrase “tissue type” does not appear anywhere in the deCharms reference. Applicants request that the Examiner provide a citation to the specific language in deCharms that supports the aforementioned assertion.

The Examiner further asserts that “deCharms discloses said atlas comprising values representative of a statistical representation of a magnetic property of a plurality of spatial locations of a plurality of subjects with said statistical representation to include a mean, variance, probability [sic] values of a tissue type at each corresponding spatial location of the subjects,” the Examiner cites [0346] [0354] [0376] [0414] [0435] [0439] [0441] [0465] [0467] [0471] [0485] and [0614-0615] to support this contention. None of the aforementioned paragraphs, nor any other paragraphs in deCharms, teaches or suggests an MRI based atlas based on MRI data from a plurality of subjects which includes tissue type. Applicants again request the Examiner refer to specific language in deCharms to support the Examiner’s assertion.

deCharms fails to teach or suggest, “*a prior probability MRI based atlas having magnetic resonance data including tissue type prior probability derived from at least one other subject*,” as recited by amended independent claim 46. deCharms does not teach or suggest an MRI based atlas having tissue type information derived from multiple subjects.

Sosa does not cure the deficiencies of deCharms. Some paragraphs in Sosa cited by the Examiner are directed to creating a three dimensional map of brain activity (electrical currents in the brain) from electric or magnetic signals measured on the surface of the body. Other paragraphs in Sosa cited by the Examiner are directed to an anatomical atlas. Sosa’s three-

dimensional map of electrical currents in the brain based on MEG is completely different than an MRI based atlas, thus, paragraph directed to three-dimensional tomographic images of the primary electric current (TPEC) of the brain are not relevant to an MRI based atlas. Sosa teaches a three-dimensional map of the probability of brain functional states (activity) based on electric or magnetic signals measured on the surface of the body, ie. EEG, MEG, EKG and MKG. A magnetoencephalograph (MEG) uses magnetic field sensors arrayed around and close to the head that provide a functional map of where certain groups of neurons fire. MEG does not provide structural information about the brain; it provides functional information about changes in the electrical currents flowing in the brain as measured on the surface of the head. A magnetocardiogram (MKG or MCG) uses magnetic field sensors arrayed around the chest of a person to measure changes in electric current in the heart, which is a functional measurement not a structural measurement. Both MEG and MKG provide one measurement for each sensor arrayed around the surface of the body.

Magnetic resonance imaging (MRI) is completely different than both MEG and MKG. MRI measures the magnetic resonance of hydrogen nuclei in a patient's body. By measuring the density of hydrogen nuclei in the body, MRI provides two-dimensional "slice" images of the structure of the patient. These two-dimensional "slice" images can be easily layered to form a three-dimensional image. MRI primarily provides structural (density) information and MEG/MKG provides functional (flow of electric current) information. MRI provides a 2-D "slice" structural image and MEG/MKG provides point measurements of the magnetic field on the surface of the body. Techniques to analyze MEG/MKG data are not useful in analyzing MRI data. An MRI based atlas is completely different than an atlas for MEG/MKG data.

MEG and MKG do not provide two-dimensional "slice" images of structure. They provide "point" measurements of a magnetic field on a surface outside of the structure. The method convert MEG and MKG "point" surface measurements into a three dimensional image of electrical currents is completely unlike methods used to manipulate MRI data because the type of data, the resolution of the data and the nature of the data is completely different the two. Because MEG and MKG only provide surface information and do not directly provide three-dimensional information, Sosa develops a system and method to use MEG or MKG

measurements and an anatomical atlas to form three-dimensional tomographic images of the primary electric current (TPEC) in the heart and in the brain.

The six cited paragraphs of Sosa which are directed to an atlas associated with MRI data [0240], [0263], [0265], [0268], [0284] and [0286] refer to an anatomical atlas. The references to an atlas associated with MR in Sosa refer to an anatomical atlas based on an individual structural image from MR, not a prior probability MRI based atlas. Sosa teaches away from an MRI based atlas as shown in paragraph [0240], “this embodiment [a TPEC in the frequency domain for EEG data] is developed for situations in which it is not convenient to obtain an individual MRI and therefore the use of Probabilistic Brain Atlas becomes necessary.”

Paragraph [0263] teaches a “cerebral anatomical atlas based on an individual structural image... a) axial slice of an MRI, to which a procedure of contour detection is applied...” This is an anatomical atlas based the use of contour detection on one MR image, not *a prior probability MRI based atlas having magnetic resonance data that is derived from at least one other subject*. Paragraph [0268] refers to the aforementioned anatomical atlas.

Paragraph [0284] refers to an anatomical atlas, “this may be either an individual or a probabilistic structural image.” Sosa explains a probabilistic structural image in paragraph [0265] referring to figure 2, “a) axial slices of an average image; b) image of the probability of appearance of gray matter: c) image of the probability of appearance of the grey matter of the occipital lobe ...” The difference between an individual and a probabilistic structural image is illustrated by the language of claim 8, “the anatomical atlas is selected from... an Individual Anatomical Atlas by the extraction of tissue probabilities of anatomical images obtained for the specific subject under study being ...(MRI)... and a Probabilistic Anatomical Atlas by a rigid or elastic transformation of the subject’s volume conductor lattice in order to ensure the best correspondance possible to a canonical volume conductor lattice for which a tissue probability distribution has obtained [sic] from a sample of normal or pathological anatomical images.” The Individual Anatomical Atlas is not *a prior probability atlas having magnetic resonance data that is derived from at least one other subject*, because it only contains images for one subject and it does not include prior probabilities. The Probabilistic Anatomical Atlas is not *a prior probability MRI based atlas having magnetic resonance data including tissue type prior*

probability derived from at least one other subject, because the Probabilistic Anatomical Atlas includes a volume conductor lattice and a tissue probability distribution. There is no teaching or suggestion that the Probabilistic Anatomical Atlas is *a prior probability MRI based atlas*, just that it includes a tissue probability distribution. More details of the Probabilistic Anatomical Atlas appear in paragraphs [0152-0155].

The modifier *a priori* is used throughout Sosa with respect to many different quantities and probabilities. The modifier is used in conjunction with an atlas in only two locations, paragraph [0286] and claim 1. The entirety of paragraph [0286] recites, “calculation of the *a priori* probabilities obtained from the anatomical atlas,” referring to a step in a sequence used by a program for calculating a TPEC. Claim 1, of Sosa recites, “calculation of the TPEC by means of Bayesian Hierarchical Estimation Procedure that determines the primary electric current $j(t)$ of the brain and heart using the structural *a priori* information obtained from an anatomical atlas.” There is no teaching or suggestion that the anatomical atlas is an *MRI based atlas having magnetic resonance data including tissue type prior probability derived from at least one other subject*.

deCharms does not teach or suggest *a prior probability MRI based atlas having magnetic resonance data including tissue type prior probability derived from at least one other subject*, as recited by amended independent claim 46. Sosa does not cure the deficiencies of deCharms. deCharms and Sosa, alone or in combination, do not teach or suggest each and every element of amended independent claim 46, which is therefore patentable. Claims 47 and 48 depend from independent claim 46 and are therefore patentable as depending therefrom, in addition to recitation of further patentable subject matter. Applicants respectfully request reconsideration and withdrawal of the rejection of claims 46-48.

Claims 50 and 51

deCharms and Sosa, alone or in combination, fail to teach or suggest each and every element of amended independent claim 50. Specifically, deCharms and Sosa fail to teach or suggest, “*a prior probability MRI based atlas having at least two magnetic property values for at least one corresponding voxel derived from at least one other subject*,” as recited by amended independent claim 50. As discussed previously, deCharms does not teach or suggest *a prior*

probability MRI based atlas. Additionally, deCharms does not teach or suggest a prior probability MRI based atlas having at least two magnetic property values for at least one corresponding voxel derived from at least one other subject. Sosa fails to cure the deficiencies of deCharms. Sosa also fails to teach or suggest a prior probability MRI based atlas with magnetic property values derived from at least one other subject. deCharms and Sosa, alone or in combination, fail to teach or suggest each and every element of amended independent claim 50 which is therefore patentable. Claim 51 depends from independent claim 50 and is therefore patentable as being therefrom, in addition to recitation of further patentable subject matter. Applicants respectfully request reconsideration and withdrawal of the rejection of claims 50 and 51.

Claims 52 and 55-56

Claim 52 is amended to incorporate the subject matter of claim 53, and claim 53 has been canceled. deCharms and Sosa, alone or in combination, fail to teach or suggest each and every element of amended independent claim 52. Specifically, deCharms and Sosa fail to teach or suggest, “a prior probability MRI based atlas, comprising... a second magnetic resonance modality volume pertaining to a second subject...and updating said magnetic property data in said node of said atlas,” as recited by amended independent claim 52. As discussed previously, deCharms does not teach or suggest a prior probability MRI based atlas. Additionally, deCharms does not teach or suggest a method making of such an atlas including data from at least two subjects. Sosa does not remedy this failing, thus, deCharms and Sosa, alone or in combination, do not teach or suggest each and every element of amended independent claim 52, which is therefore patentable. Claims 55 and 56 depend from independent claim 52 and are therefore patentable as being therefrom, in addition to recitation of further patentable subject matter. Applicants respectfully request reconsideration and withdrawal of the rejection of claims 52, 55 and 56.

Claim 57

Claim 57 is amended to incorporate the subject matter of claim 58, and claim 58 has been canceled. deCharms and Sosa, alone or in combination, fail to teach or suggest each and every element of amended independent claim 57. Specifically, deCharms and Sosa fail to teach or suggest a method for creating “a prior probability MRI based atlas, comprising... providing a

plurality of magnetic resonance modality volumes pertaining to a plurality of subjects... providing a plurality of labeled volumes... indicating tissue types of tissue corresponding to said voxels... and updating said magnetic property data in said node of said atlas,” as recited by amended independent claim 57. As discussed previously, deCharms does not teach or suggest a prior probability MRI based atlas. Additionally, deCharms does not teach or suggest a method for making such an atlas including magnetic resonance data and tissue types from a plurality of subjects. Sosa does not remedy this failing, thus, deCharms and Sosa, alone or in combination, do not teach or suggest each and every element of amended independent claim 57, which is therefore patentable.

Claims 69-74 and 76

Claim 69 is amended to incorporate the subject matter of claim 75, and claim 75 has been canceled. deCharms and Sosa, alone or in combination, fail to teach or suggest each and every element of amended independent claim 69. Specifically, deCharms and Sosa fail to teach or suggest, “a prior probability MRI based atlas... comprising: a plurality of nodes corresponding to a plurality of voxels representing spatial locations of a subject, each of said nodes configured to store at least two magnetic property values for each of said voxels as determined by magnetic resonance imaging of a plurality of subjects, and wherein said magnetic property values correspond to tissue type,” as recited by amended independent claim 69. As discussed previously, deCharms does not teach or suggest a prior probability MRI based atlas. Additionally, deCharms does not teach or suggest a prior probability MRI based atlas with magnetic property values as determined by magnetic resonance imaging of a plurality of subjects. Further, deCharms does not teach or suggest wherein said magnetic property values correspond to tissue type. Sosa fails to cure the deficiencies of deCharms. Sosa also fails to teach or suggest a prior probability MRI based atlas with magnetic property values as determined by magnetic resonance imaging of a plurality of subjects wherein said magnetic property values correspond to tissue type. deCharms and Sosa, alone or in combination, fail to teach or suggest each and every element of amended independent claim 69 which is therefore patentable. Claims 70-74 and 76 depend from independent claim 69 and are therefore patentable as being therefrom, in addition to recitation of further patentable subject matter. Applicants respectfully request reconsideration and withdrawal of the rejection of claims 69-74 and 76.

Claim 77

deCharms and Sosa, alone or in combination, fail to teach or suggest each and every element of amended independent claim 77. Specifically, deCharms and Sosa fail to teach or suggest, “a prior probability MRI based atlas... compromising... at least one tissue type prior probability value corresponding to a tissue type of a voxel,” as recited by amended independent claim 77. As discussed previously, deCharms does not teach or suggest a prior probability MRI based atlas. Additionally, deCharms does not teach or suggest a prior probability MRI based atlas including at least one tissue type prior probability value corresponding to a tissue type of a voxel. Sosa does not remedy this failing, thus, deCharms and Sosa, alone or in combination, do not teach or suggest each and every element of amended independent claim 77, which is therefore patentable. Applicants respectfully request reconsideration and withdrawal of the rejection of claim 77.

Claims 78-80

deCharms and Sosa, alone or in combination, fail to teach or suggest each and every element of amended independent claim 78. Specifically, deCharms and Sosa fail to teach or suggest, “a prior probability MRI based atlas... comprising: a plurality of nodes... to store... a statistical representation of at least one magnetic property value... and a statistical representation of at least one tissue type prior probability value corresponding to a tissue type for each of a plurality of corresponding voxels of a plurality of subjects,” as recited by amended independent claim 78. As discussed previously, deCharms does not teach or suggest a prior probability MRI based atlas. Additionally, deCharms does not teach a prior probability MRI based atlas including a nodes to store a statistical representation of at least one tissue type prior probability value for each voxel of a plurality of subjects. Sosa does not remedy this failing, thus, deCharms and Sosa, alone or in combination, do not teach or suggest each and every element of amended independent claim 78, which is therefore patentable. Claims 79 and 80 depend from independent claim 78 and are therefore patentable as being therefrom, in addition to recitation of further patentable subject matter. Applicants respectfully request reconsideration and withdrawal of the rejection of claims 78-80.

Claims 81, 82 and 84-87

Claim 81 is amended to incorporate the subject matter of claim 83, and claim 83 has been canceled. deCharms and Sosa, alone or in combination, fail to teach or suggest each and every element of amended independent claim 81. Specifically, deCharms and Sosa fail to teach or suggest, “a prior probability MRI based atlas ... comprising...values as determined by magnetic resonance... of a plurality of subjects... tissue type prior probability value corresponding to a tissue type for each of a plurality of corresponding voxels of a plurality of subjects,” as recited by amended independent claim 81. As discussed previously, deCharms does not teach or suggest *a prior probability MRI based atlas*. deCharms further fails to teach or suggest *a prior probability MRI based atlas* including *tissue type prior probability* values corresponding to voxels for *a plurality of subjects*. Sosa does not cure the deficiencies of deCharms, thus, deCharms and Sosa, alone or in combination, fail to teach or suggest each and every element of amended independent claim 81 which is therefore patentable. Claims 82 and 84-87 depend from amended independent claim 81 and are therefore patentable as being therefrom, in addition to recitation of further patentable subject matter. Applicants respectfully request reconsideration and withdrawal of the rejection of claims 82 and 84-88.

Claims 88 and 89

Claim 88 is amended to incorporate the subject matter of claim 91, and claim 91 has been canceled. Claim is 90 redundant in light of the amendment and is also canceled. deCharms and Sosa, alone or in combination, fail to teach or suggest each and every element of amended independent claim 88. Specifically, deCharms and Sosa fail to teach or suggest, “a prior probability MRI based atlas... a prior probability of a tissue type located at said voxel corresponding to said node... wherein said voxels correspond to a plurality of subjects and a plurality of tissue types are located at said node and said statistical value is comprised of a plurality of statistical values calculated for each of said tissue types,” as recited by amended independent claim 88. As discussed previously, deCharms does not teach or suggest *a prior probability MRI based atlas*. deCharms further fails to teach or suggest *a prior probability MRI based atlas* wherein voxels correspond to *a plurality of subjects* and *a plurality of tissue types*. Sosa does not cure the deficiencies of deCharms, thus, deCharms and Sosa, alone or in combination, fail to teach or suggest each and every element of amended independent claim 88 which is therefore allowable. Claim 89 depends from amended independent claim 88 and is therefore patentable as being therefrom, in addition to recitation of further patentable subject

matter. Applicants respectfully request reconsideration and withdrawal of the rejection of claims 88 and 89.

Claim 92

deCharms and Sosa, alone or in combination, fail to teach or suggest each and every element of amended independent claim 92. Specifically, deCharms and Sosa fail to teach or suggest, “a prior probability MRI based atlas... comprising... at least one magnetic property value as determined by magnetic resonance imaging at least one tissue type prior probability value corresponding to a tissue type of a voxel,” as recited by amended independent claim 92. As discussed previously, deCharms does not teach or suggest a *prior probability MRI based atlas*. deCharms further fails to teach or suggest a *prior probability MRI based atlas* including *at least one tissue type prior probability value corresponding to a tissue type of a voxel*. Sosa does not cure the deficiencies of deCharms, thus, deCharms and Sosa, alone or in combination, fail to teach or suggest each and every element of amended independent claim 92 which is therefore allowable. Applicants respectfully request reconsideration and withdrawal of the rejection of claim 92.

Claims 93-95

deCharms and Sosa, alone or in combination, fail to teach or suggest each and every element of amended independent claim 93. Specifically, deCharms and Sosa fail to teach or suggest, “a prior probability MRI based atlas having magnetic resonance data including more than one magnetic property value prior probability derived from at least one other subject,” as recited in amended independent claims 93. As discussed previously, deCharms does not teach or suggest a *prior probability MRI based atlas*. deCharms further fails to teach or suggest a *prior probability MRI based atlas* having magnetic resonance data including *more than one magnetic property value prior probability from at least one other subject*. Sosa does not cure the deficiencies of deCharms, thus, deCharms and Sosa, alone or in combination, fail to teach or suggest each and every element of amended independent claim 93 which is therefore allowable. Claims 94 and 95 depend from independent claim 93 and are therefore patentable as being therefrom, in addition to recitation of further patentable subject matter. Applicants respectfully request reconsideration and withdrawal of the rejection of claims 93, 94 and 95.

Claim 96

deCharms and Sosa, alone or in combination, fail to teach or suggest each and every element of amended independent claim 93. Specifically, deCharms and Sosa fail to teach or suggest, “a prior probability MRI based atlas from prior MR scans of subjects including nodes which each include: tissue type probability information, at least one magnetic property value, and location information,... and aligning the MR scan and/or segmenting the MR scan,” as recited by amended independent claim 93. As discussed previously, deCharms does not teach or suggest a *prior probability MRI based atlas*. Further, deCharms fails to teach or suggest an atlas formed from prior MR scans of subjects including nodes which include *tissue type probability information*, thus, deCharms further fails to teach or suggest *aligning the MR scan and/or segmenting the MR scan* using such an atlas. Sosa does not cure the deficiencies of deCharms, thus, deCharms and Sosa, alone or in combination, fail to teach or suggest each and every element of amended independent claim 96 which is therefore allowable. Applicants respectfully request reconsideration and withdrawal of the rejection of amended independent claim 96.

Claims 97 and 98

deCharms and Sosa, alone or in combination, fail to teach or suggest each and every element of amended independent claim 97. Specifically, deCharms and Sosa fail to teach or suggest, “a prior probability MRI based atlas from at least three MR scans of other subjects... each node including ...prior probability of specific tissue types of neighboring nodes for each tissue type at this nodal location, ... interfacing the magnetic resonance image with the a priori nodal information from the previously constructed atlas; and aligning the MR scan and/or segmenting the MR scan to maximize the post probability of its voxel components matching both position in anatomic space and at least one MR tissue characteristic of the nodes determined a priori in the reference atlas,” as recited in amended independent claim 97.

As discussed previously, deCharms and Sosa, alone or in combination, do not teach or suggest a *prior probability MRI based atlas* from MR scans of multiple subjects. Further, neither deCharms nor Sosa teach or suggest an atlas including *prior probability of specific tissue types of neighboring nodes for each tissue type* at a particular node. This type of *a priori* information is critical for optimizing the registration of new data to the atlas and for the accurate anatomical segmentation of that data. deCharms and Sosa, alone or in combination, fail to teach

or suggest each and every element of amended independent claim 96 which is therefore patentable. Claims 97 and 98 depend from independent claim 96 and are therefore patentable as being therefrom, in addition to recitation of further patentable subject matter. Applicants respectfully request reconsideration and withdrawal of the rejection of claims 96-98.

Claim 99

deCharms and Sosa, alone or in combination, fail to teach or suggest each and every element of amended independent claim 99. Specifically, deCharms and Sosa fail to teach or suggest, “an *a priori* nodal atlas... comprising... prior probability of specific tissue types of neighboring nodes for each tissue type at the nodal location,” as recited by amended independent claim 99. Both deCharms and Sosa are silent regarding *prior probability for specific tissue types of neighboring nodes for each tissue type at a nodal location*. No combination of deCharms and Sosa teaches or suggests prior probability values for tissue types of neighboring nodes stored at a node. deCharms and Sosa, alone or in combination, fail to teach or suggest each and every element of amended independent claim 99 which is therefore allowable. Applicants respectfully request reconsideration and withdrawal of the rejection of amended independent claim 99.

New Claim 100

New claim 100 recites a method for alignment and/or segmentation of MR scans using an *a priori* nodal atlas as a reference. Each node of the atlas is based on at least 3 MR scans and includes prior probability for specific tissue types and prior probability for specific tissue types of neighboring nodes for each tissue type at a nodal location. Both references are silent regarding prior probability for specific tissue types of neighboring nodes for each tissue type at a nodal location. deCharms and Sosa, alone or in combination, do not teach or suggest each and every element of new claim 100. Applicants submit that new claim 100 is patentable in view of deCharms and Sosa.

New Claim 101

New claim 101, which depends from claims 69 and recites, “*wherein tissue type comprises a labeled anatomical structure.*” Support for this amendment appears in paragraph [0045] of the specification which recites, “the tissue type can be more specific, such as referring

to anatomical structure...in the case of a brain as the subject, the tissue type may designate... the hippocampus, or other appropriate anatomical structure label... in the case of the spine as a subject... specifically vertebral bodies, or other appropriate anatomical structure labels.” Prior probabilities concerning tissue type associated with a node in the atlas may refer to the probability that the voxel represents magnetic properties of a brain region corresponding to a particular cerebral structure (like the hippocampus) rather than solely the probability of the node being located in a more general class of tissue, such as grey matter. deCharms does not mention tissue type. Within Sosa, tissue type is restricted to grey matter and grey matter within the occipital lobe as described in paragraph [0265]. Sosa and deCharms, alone or in combination, do not teach or suggest prior probabilities concerning tissue types, wherein the tissue types are labeled anatomical structures. Applicants respectfully submit that new claims 101 is patentable in view of deCharms and Sosa.

Atlas Based on MRI Measurements of Multiple Subjects

Embodiments of the present invention use MRI measurements from multiple subjects to build an accurate prior probability MRI based atlas that includes tissue type. Such an atlas, built from MRI measurements of previous subjects can be used to segment and/or align MR scans of new subjects. Figures 9A and 9B and page 11, line 19, to page 12, line 13, provide an illustrative example of how prior probabilities of tissue types for a single node are calculated from MR measurements on multiple subjects. From page 12, line 23, to page 14, line 23, and in figures 10 and 11 the specification provides a detailed description for construction of a prior probability MRI based atlas that include tissue type. The specification explains how incorporating data from multiple subjects increases the accuracy of the atlas.

deCharms and Sosa use atlases from structural MR scans simply to compare structural MR data to another type of data. deCharms uses structural MR data from a subject to compare to physiological MR data for the same subject. Sosa uses an anatomical atlas to compare with MEG and EEG data. Neither deCharms nor Sosa teaches or suggests improving the accuracy of an MRI based atlas that includes tissue type, thus, neither deCharms nor Sosa teaches or suggests a prior probability MRI based atlas that includes tissue type that is based on MRI data from multiple subjects.

CONCLUSION

In view of the foregoing amendments and remarks, it is respectfully submitted that this application is now in condition for allowance. Applicants courteously solicit allowance of the claims in the form of a Notice of Allowance. Should there be any outstanding issues of patentability following the entry of this response, a telephone interview is respectfully requested to resolve such issues.

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